

C-6.11 Use a variety of procedures for separating mixtures (including distillation, crystallization filtration, paper chromatography, and centrifuge).

Revised Taxonomy Level 3.2 C_A Apply (use) procedural knowledge

In physical science students

- ❖ Classify matter as a pure substance (either an element or a compound) or as a mixture (either homogeneous or heterogeneous) on the basis of its structure and/or composition. (PS-3.4)
 - Students must also understand that when matter is composed of two or more component substances which retain their own identifying properties, the matter is classified as a *mixture*.
 - ◆ A mixture can be separated physically because the components of the mixture have different physical properties. Mixtures do not have definite composition; the components of a mixture may be in any ratio.
 - ◆ Procedures for separating mixtures include: Dissolving, Filtering, Evaporating, Decanting, Magnetic separation, or Separating by particle size
 - ◆ Mixtures can be classified into two groups, heterogeneous and homogeneous.
 - *Heterogeneous mixtures* do not have the components distributed evenly throughout.
 - *Homogeneous mixtures* have components evenly distributed. The components are small that they can not be seen with the naked eye.
 - A *solution* is a homogeneous mixture in which the components are close to the size of individual particles of the substance (atoms, molecules, or ions) and therefore, too tiny to be seen with a microscope.(Ions will be addressed in PS-4.2)
 - Students should know that mixtures can occur among all phases of matter:
 - ◆ Gas/gas (air), Gas/liquid (oxygen in water), Liquid/liquid (alcohol in water), Liquid/solid (sugar in water), Solid/solid (alloy such as steel)

It is essential for students to

- ❖ Describe what types of mixtures are best suited for each separation process and give examples.
- ❖ Apply various process for separating mixtures of various substances
 - Describe the importance of each step in each of the above separation processes to the overall process.
- ❖ Understand how differentiation in the properties of the components of the mixture allow for each process

Assessment

The revised taxonomy verb for this indicator is implement (use), the major focus of assessment will be for students to show that they can “apply a procedure to an unfamiliar task”. The knowledge dimension of the indicator, procedural knowledge means “knowledge of subject-specific techniques and methods” In this case various procedures for separating a mixture. Assessments should require that students show that they can apply the knowledge to a new situation, not just repeat the exact procedures which they have studied. This requires that students have a conceptual understanding of each process.

